REMARKS:

This is a full and complete response to the Office action dated July 19, 2010. Favorable reconsideration of the claims is respectfully requested.

REGARDING THE CLAIMS:

Claims 36–59 are pending in the application. New claims 56-59 have been added. Support can be found in the original claims and Figs. 1, 4-5, as well as paragraphs 69 and 71. No new matter has been added.

Applicants note that independent claims 36 and 37 now recite "said gas component being constituted by an oxide of nitrogen (NO_x compound) or water." Such recitation is in conformance with the restriction made February 9, 2006 and as well as the response filed August 14, 2006, wherein species 3 including Fig. 5 was elected. Current claims 36 and 37 are generic to species 1, 2 and 3 made by Examiner.

IN RESPONSE TO THE OFFICE ACTION:

REJECTION UNDER 35 U.S.C. § 103 – AINE IN VIEW OF KATO :

Claims 36 and 46 stand rejected under 345 USC §103(a) as being unpatentable over Aine, US 3,903,694 (hereinafter "Aine") in view of Henis et al., US 4,230,463 (hereinafter "Henios"), and Kato et al., US 5,953,907, (hereinafter "Kato").

In the Office action it is asserted that Aine discloses a device and method for reducing an amount of a gas component in an exhaust gas flow of a combustion engine. However, it is conceded by the Examiner that Aine does not disclose a wall structure made up of a porous material which provides a selective passage of the gas component through the wall structure based on molecular size and molecular form.

However, the on page 4 of the Office action it is asserted that Henis discloses a multicomponent membrane for gas separation by permeation based on molecular size and molecular form. Accordingly, it is concluded in the Office action that it would be obvious to one of ordinary skill in the art to employ the membrane of Henis in the separation unit of Aine.

Applicants respectfully disagree.

Henis does not disclose, teach or suggest a membrane which provides a selective passage of a gas component through the wall structure due to the molecular size and molecular form of the gas component. In fact Henis teaches against separation based on molecular size and molecular form.

Instead Henis discloses a multi-component membrane comprising a porous membrane material the pores of which are <u>occluded</u> by a coating on the feed side of the multi-component membrane. The coating is non-porous and the molecular size of the molecules forming the coating are roughly in the same range as the pore size of the porous membrane so that the pores can be occluded by the coating.

Accordingly, although a porous membrane is employed Henis, the pores are purposely blocked (occluded) by a coating. Therefore, it is intended by Henis that gases are separated via permeation not through the pores, but instead through the membrane material itself.

For example, in its background, when discussing the drawbacks of certain prior membranes, it was stated "Since gases have extremely low absorption, viscosity and cohesive properties, <u>no barrier is provided to prevent the gases from readily passing through the pores</u> in such a membrane resulting in little, if any, separation of gases." (emphasis added) *Henis, col. 5, lines 3-8*. Thus, Henis criticizes past membranes for allowing gas passage through pores.

In discussing its own asserted invention, this drawback is intended to be avoided, accordingly stating:

> The material of the porous separation membrane exhibits selective permeation for at least one gas of a gaseous mixture over that of at least one remaining gas of the mixture, and hence the porous separation membrane is defined as a "separation" membrane. By describing the separation membrane as "porous" it is meant that the membrane has continuous channels for gas flow, i.e., pores, which communicate between the feed surface and exit surface. <u>**These continuous channels, if sufficiently large in number and in cross-section, can permit essentially all of a gaseous mixture to flow through the porous separation membrane with little, if any, separation due to interaction with the material of the porous separation membrane**</u>. This invention advantageously

> provides multicomponent membranes wherein the separation of at least one gas from a gaseous mixture **by interaction with the material** of the porous separation membrane is enhanced, as compared to that of the porous separation membrane alone. (emphasis added) *Henis, col. 7, lines 25-30.*

From the above portion it can be seen that the difficulty membranes is that the gases to be separated might pass through the pores of the membrane. Accordingly, it is intended by Henis that separation occurs by interaction of the gas with the material of the membrane, rather than by an uncoated membrane where gas molecules might merely pass through the pores.

In order to prevent gases from passing through the pores, Henis provides an occluding coating on the membrane. As is stated:

> **The coating is preferably in occluding contact with the porous separation membrane such that**, with respect to the models which have been developed based on observation of the performance of the multicomponent membranes of this invention, **increased resistance to the passage of gases through the pores of the separation membrane is provided**, and the proportion of gases passing through the material of the porous separation membrane to gases passing through the pores is enhanced over that proportion using the porous separation membrane not having the coating. *Henis, col. 22, lines 12-23.*

Accordingly, the coating is provided to prevent the passage of gases through the pores of the membrane. Moreover, when discussing the size of the molecules, it is indicated they should fit the size of the pores:

> If the molecular size of the material of the coating is too large to be accommodated by the pores of the porous separation membrane, the material may not be useful to provide occluding contact. **If, on the other hand, the molecular size of the material for the coating is too small, it may be drawn through the pores of the porous separation membrane during coating and/or separation operations**. Thus with porous separation membranes having larger pores, it may be desirable to employ materials for coating having larger molecular sizes than with smaller pores. (emphasis added) *Henis, col. 19, lines 25-35.*

Accordingly it is not desirable for the coating to be so small as to be drawn through the pores, but instead to be sized to fit therein.

Finally, when discussing the porosity of the membrane, Henis indicates that a lower pore range is desirable so as to increase the area of the material of the membrane.

> The porous separation membranes significantly affects the separation of the multicomponent membranes of this invention, and accordingly, **it is desirable to provide a large ratio of total surface area to total pore cross-sectional area in the porous separation membrane**. (emphasis added) *Henis, col. 21, lines 48-53.*

Thus Henis intends to have a large surface area of material rather than pores for separations. Furthermore, the coating is supposed to have a much higher permeability rate than the membrane. *Henis, col. 19, lines 1-7.*

From the above portions, it is clear that the separation of gases is not due to the molecular form and size of the gas but due to the intrinsic properties of the membrane material. The examples of Henis also support this view. Examples 2 and 3 (see Table 1) show the separation properties of the same multi-component membrane but for two different gases, i.e. for O_2 and H_2. If a membrane can be used for the separation of two different gases, the separation mechanism is most likely not propelled by the molecular form and size of the gases which are permeated through the membrane.

Additionally, as can be seen from examples 4 to 10 (*see Table II*), the properties of the coating strongly influences the separation properties of the membrane. In Table II, the permeabilities of O_2 through multi-component membranes are compared, wherein the porous membrane remains the same but the coating differs. Since the permeability is strongly influenced by a coating which occludes the pores of the porous membrane, the separation of gases is not due to a selective passage through the porous material based on the molecular size and form of the gas.

Accordingly, in view of the above, none of the cited references, taken alone or in combination disclose, teach or suggest the present claims.

REJECTION UNDER 35 U.S.C. § 103 – AINE IN VIEW OF HENIS, KATO AND CASEY :

Claims 37 and 47 stand rejected under 345 USC §103(a) as being unpatentable over Aine, in view of Henis and Kato and further in view of Casey, US 5,661,973 (hereinafter "Casey").

Applicants re-assert the arguments made above with respect to Aine, Henis and Kato. Therefore, as claims 37 and 47 depend from claims 36 and 46 respectively, Applicants submit that for at least the same reasons the above mentioned rejection should also be withdrawn. The Casey reference does nothing to remedy the deficiency of disclosure of the aforementioned references. Applicants therefore submit that the claimed invention would not have been obvious at all even additionally in view of Casey.

Accordingly, for at least the above reasons, Applicants request the above mentioned rejection be withdrawn.

In view of the foregoing as well as the previous Remarks, Applicants submit that all pending claims are in condition for allowance, and timely Notice to that effect is respectfully requested.

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The undersigned representative requests any extension of time that may be deemed necessary to further the prosecution of this application.

The undersigned representative authorizes the Commissioner to charge any additional fees under 37 C.F.R. 1.16 or 1.17 that may be required, or credit any overpayment, to Deposit Account No. 14-1437, referencing Attorney Docket No.: 0173.019.PCUS00.

In order to facilitate the resolution of any issues or questions presented by this paper, the Examiner may directly contact the undersigned by phone to further the discussion.

Respectfully submitted,

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